United States Patent

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[54] **SWITCH MECHANISM FOR TRACKS**
8 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **246/433**
[51] **Int. Cl.** **E01b 7/08**
[50] **Field of Search** 246/415, 421, 433, 313

[56] **References Cited**

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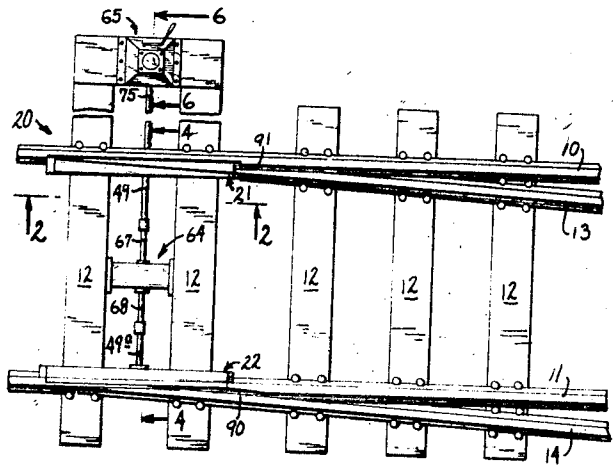
ABSTRACT: Switch mechanism associated with a vehicle supporting pair of main tracks and a pair of side tracks which has a pair of housings adapted to mount a pair of track portions at the juncture of the pair of main and side tracks. The track portions are mounted in their respective housings for generally horizontally disposed vertical movements between operative and inoperative positions. Cam means is mounted in the housings for movement thereof longitudinally of the track portions and means within the housing imparts simultaneous movements to the cam means in directions longitudinally of the track portions and to the track portions to move the track portions vertically into position to allow the vehicle to travel along the pair of main tracks or alternately switch the vehicle to the pair of side tracks.



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SHEET 1 OF 3

FIG. 1

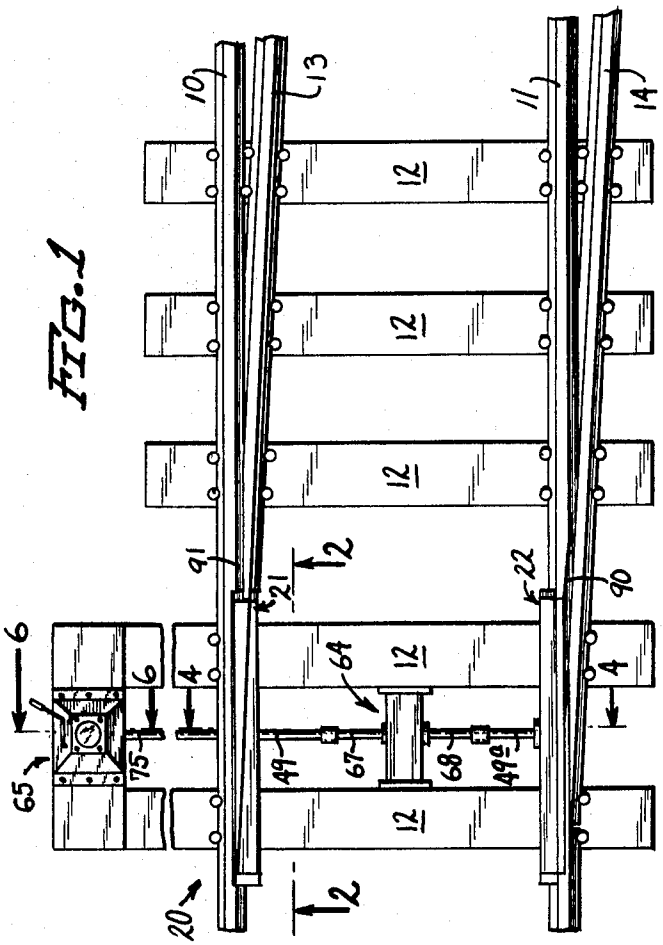


FIG. 2

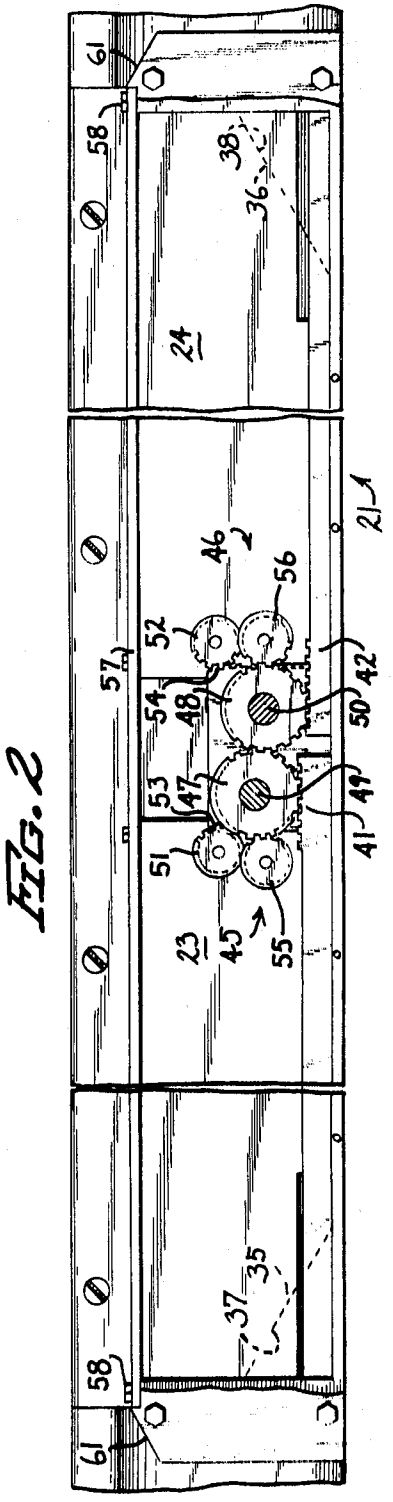
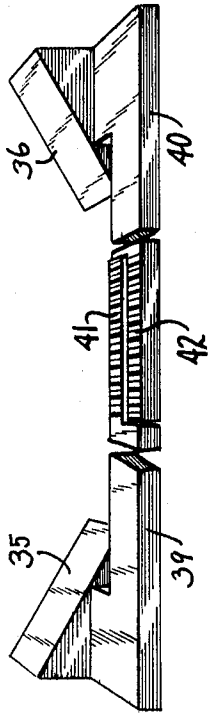


FIG. 5



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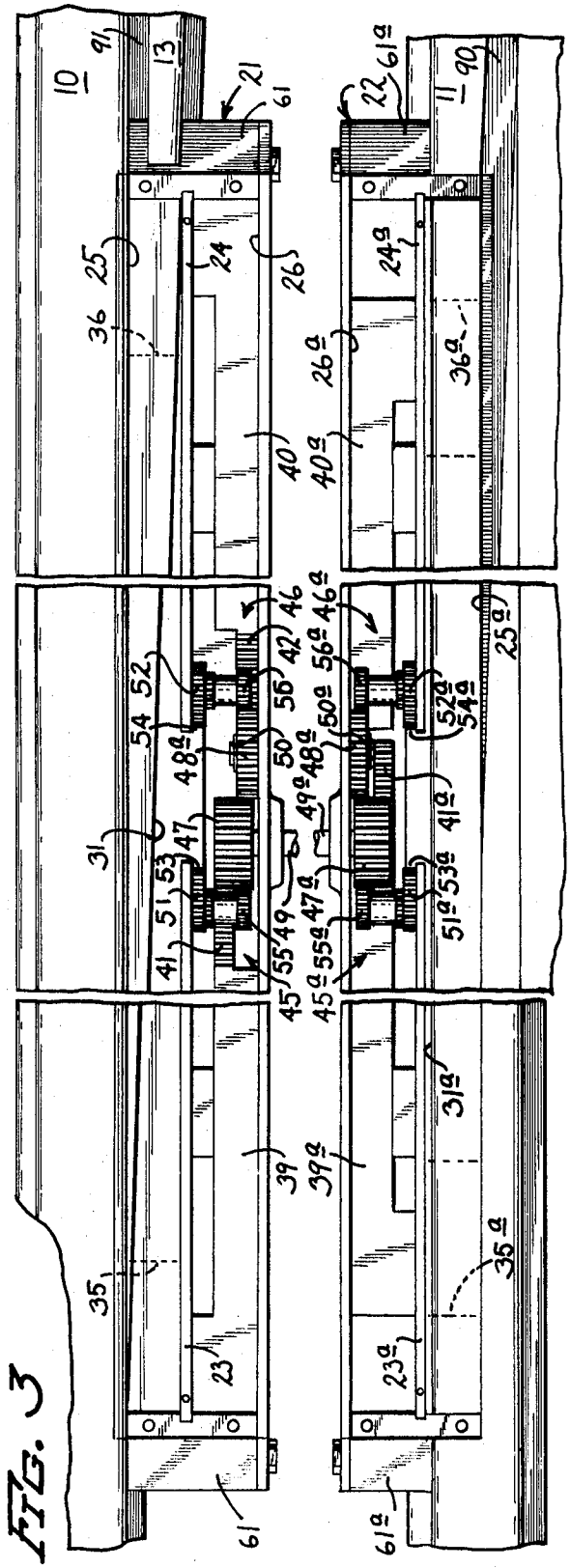

FIG. 3

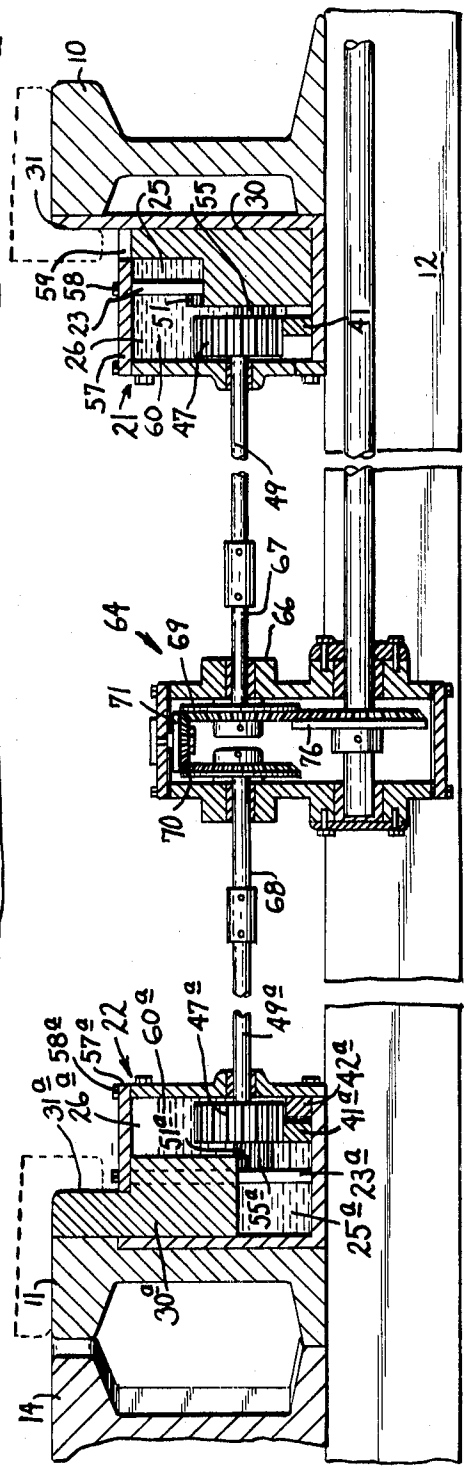

FIG. 4

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FIG. 7

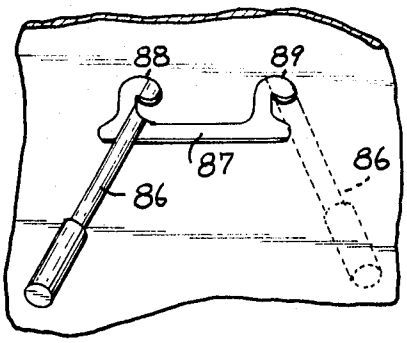

FIG. 8

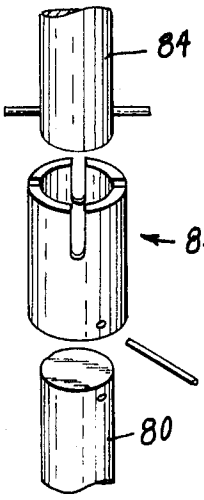

FIG. 6

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SWITCH MECHANISM FOR TRACKS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to vehicle switch mechanism for railroad tracks and the like and more specifically to such switch mechanism which is substantially enclosed within a housing means.

2. Description of the Prior Art

Prior art switch mechanisms, of the above character, have operating mechanism which is generally exposed to the elements. That is, rocks, stones and other like foreign particles lying along the tracks may become lodged in the operating mechanism, thus rendering the switch inoperative. Additionally, in northern climates, the winter months bring the additional problem of snow and ice. Such snow or ice may enter the working mechanism in the form of either snow, ice or water. In the case of snow or ice the mechanism may be jammed in much the same manner as it would be in the case of stones, rocks or other like foreign particles and in the case of water such water may become frozen, thus rendering the movable parts immovable. Also, prior art devices are extremely susceptible to rust and/or dust like particles which have the effect of causing the movable parts of the switching mechanism to become very hard to operate.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a switch mechanism for a pair of main tracks and a pair of side tracks extending therefrom which is substantially enclosed within housing means to protect same from the elements.

It is a further object of the present invention to provide a device of the character above described which is provided with a liquid lubricant in order to maintain ease of operation thereof.

It is a still further object of the present invention to provide a device of the character above described which is relatively inexpensive to produce, durable in use, and foolproof in operation.

To the above ends there is provided a pair of housings, one each of which is mounted on one of and between a pair of main tracks at the juncture thereof with a pair of side tracks. Each of said housings is mounted below the uppermost surface of the tracks and serves to mount a track portion for vertical movements between an operative position and an inoperative position. Cam means is mounted in each of the housings in underlying relationship to opposite ends of each of the track portions, for movements longitudinally of the track portion and is engageable with the opposite ends of a respective track portion whereby to support same in a generally horizontally disposed position during vertical movements of the respective track portions. Means is mounted within each of the housings for imparting simultaneous movements to the cam means in directions longitudinally of the respective track portions thereof and to the respective track portions in a vertical direction whereby to move the track portions in a horizontally disposed, vertical direction to switch a vehicle from the pair of main tracks to the pair of side tracks or permit a vehicle to maintain travel along the pair of main tracks. Each of the housings is filled with a liquid lubricant so as to enhance ease of operation thereof during switching movements of the track portions.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings wherein like characters represent like parts throughout the several views:

FIG. 1 is a plan view of a pair of main tracks and a pair of side tracks extending therefrom having a switch mechanism and control means therefor constructed in accordance with the present invention mounted with respect thereto;

FIG. 2 is an enlarged view in vertical section as seen generally from the line 2–2 of FIG. 1 portions thereof being broken away;

FIG. 3 is an enlarged fragmentary view in top plan of the switch mechanism of FIG. 1, portions thereof broken away and portions thereof removed to better illustrate the working mechanism thereof;

FIG. 4 is an enlarged vertical section as seen generally from the line 4–4 of FIG. 1, portions thereof broken away;

FIG. 5 is a view in perspective of cam means utilized with the present invention;

FIG. 6 is an enlarged vertical section as seen from the line 6–6 of FIG. 1, portions thereof being broken away;

FIG. 7 is a fragmentary view in perspective of the manual control portion of FIG. 6; and

FIG. 8 is a fragmentary exploded perspective of a releasable coupling for operatively connecting the manual control of FIG. 6 to automatic means for operating the switch mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, and initially to FIG. 1 thereof, a pair of main line tracks **10**, **11** are shown as being supported on a plurality of tie elements **12** extending transversely and spaced longitudinally of the tracks **10**, **11**. A pair of side tracks **13**, **14** extend from the main line tracks **10**, **11** and are supported by the tie elements **12** at their point of juncture with the main tracks **10**, **11**.

Switch mechanism, indicated generally by the numeral **20**, for switching a vehicle from travel along the main tracks **10**, **11** onto the side tracks **13**, **14** includes housing means in the nature of a pair of housings **21**, **22**. Housings **21**, **22** are one each secured to one of the main line tracks **10**, **11**, respectively, at the juncture of the tracks **13**, **14** with the tracks **10**, **11**. Each of the housings **21**, **22** are supported by an adjacent pair of tie elements **12** and their connection to their respective tracks **10**, **11**. Each of the housings **21**, **22** serves to mount substantially identical mechanism for switching a vehicle from the main tracks **10**, **11** to the side tracks **13**, **14**, and, therefore, only the mechanism within the housing **21** will be described in detail. Since the mechanism in the housing **22** is substantially identical to that of housing **21**, like parts will be identified in the drawings by like numerals with the lower case letter *a* added.

As shown, particularly in FIGS. 2—4, housing **21** includes partition elements **23**, **24**, which divides the housing **21** into first and second housing chambers **25**, **26**. Mounted in the chamber **25**, in juxtaposition to the track **10**, for vertical movements between a lowered inoperative and an elevated operative position, is a track portion **30**. Track portion **30** includes an upper portion which is tapered to define a camming surface **31** that is engageable by the flange of a vehicle wheel, shown by dotted lines in FIG. **4**, so as to switch same from track **10** to track **13**, and a lower portion which is of a dimension to be received within and guided by the walls of housing **21** defining the first chamber **25** during vertical movements thereof.

For the purpose of supporting opposite ends of the track portion **30** during vertical movements thereof, and when track portion **30** is in an elevated operative position, there is provided cam means in the nature of first and second incline ramps **35**, **36**, see FIGS. **2**, **3** and **5**. Opposite ends of the track portion **30** are angularly relieved as at **37**, **38**, and each of the inclined ramps **35**, **36** is mounted, in underlying relationship to the opposite ends of the track portion **30**, with the upper surface thereof in engagement with an adjacent surface of a respective relieved portion **37**, **38** for reasons which will become apparent hereinafter. Arms **39**, **40** extend laterally from each of the ramp portions **35**, **36**, respectively, through openings formed in the partitions **23**, **24**, and thence extend longitudinally in chamber **26** of the housing **21** and terminate at a point generally centrally of the housing **21**. Rack gears **41**,

42 are formed on the upper surface of each of the terminal ends of the arms 39, 40 and extend from the terminal end of their respective arms 39, 40 for a distance toward a respective inclined ramp 35, 36. With the above-described structure, the inclined ramp 35, 36 and their respective arms 39, 40 are mounted in the housing 21 for movements longitudinally of the track portion 30 during vertical movements of the track portion 30 and serve to maintain the track portion 30 in a generally horizontal condition during vertical movements thereof and when track portion 30 is in an elevated operative position.

Means mounted within the chamber 26 of housing 21 for imparting simultaneous movements to the inclined ramps 35, 36 in directions longitudinally of the track portion 30 and to the track portion 30 in a vertical direction includes first and second gear trains indicated generally by the numerals 45, 46.

Each of the gear trains 45, 46 includes a driving gear 47, 48 respectively which is mounted in meshing engagement with each other and with each one of the rack gears 41, 42 associated with a respective inclined ramp 35, 36. Driving gears 47, 48 are each mounted for rotation on shafts 49, 50 mounted on a side wall of the housing 21 so as to position the gears 47, 48 in overlying relationship to the rack gears 41, 42. Shaft 50 is fixedly carried by the wall of housing 21 and drive gear 48 is rotatably mounted thereon. Drive gear 47 is fixedly mounted to the shaft 49 and shaft 49 is rotatably mounted in the adjacent wall of the housings 21 so as to extend laterally outwardly from housing 21 toward a point centrally between the tracks 10, 11. Driven gears 51, 52 are one each respectively rotatably mounted on one of the partitions 23, 24 and have meshing engagement with vertically extended longitudinally spaced rack gears 53, 54.

Rack gears 53, 54 are carried by a boss formed on a side of the track portion 30 which extends laterally from the track portion 30 between the partition 23, 24 and terminates in the second chamber 26. Intermediate gears 55, 56 are rotatably journaled in the chamber 26 so as to have meshing engagement with the driving and driven gears 47, 48, 51, 52 of a respective gear train 45, 46. It will be noted that all of the gears of the gear trains 45, 46 are mounted on horizontal axes which are parallel and which extend transversely of the longitudinal axis of the housing 21. With the above structure it will be seen that rotation of the shaft 49 and drive gear 47 carried thereby in a counterclockwise direction will cause the driving gear 48 of gear train 46 to rotate in a clockwise direction and the respective rack gears 41, 42, arms 39, 40 and inclined ramps 35, 36 to move in a longitudinal direction relative to the housings 21 wherein the upper surface of the inclined ramps 35, 36 engage an adjacent surface of a respective portion 37, 38 of the track portion 30. Simultaneously, the intermediate gears 55, 56 and driven gears 51, 52 associated therewith are driven in a direction to cause the rack gears 53, 54 and track portion 30 associated therewith to be moved in a vertically upward direction to a position wherein the uppermost surface of the track portion 30 will lie generally in the same plane as the upper surface of track 10. As seen particularly in FIGS. 3, 4 and 5, rack gears 41, 42 are laterally offset from one another transversely of chamber 26 so as to overlap when the arms 39, 40 and inclined ramps 35, 36 are moved to the above-described position. Also, by reference to FIG. 2, it will be noted that rack gear 41 and the axis of drive gear 47 are slightly elevated with respect to rack gear 42 and the axis of drive gear 48. In this manner, during the above-described movements of the rack gears 41, 42, rack gear 42 will pass under drive gear 47 without engaging same. Further, it will be noted by reference to FIG. 3, that drive gear 48 has a dimension along its axis of rotation substantially less than that of drive gear 47. This provides proper clearance for the passage of rack gear 41 without engagement with drive gear 48 during the above-described movements.

For the purpose of enclosing the housing 21, a cover element 57 is mounted to close the upper side of the housing 21. A plurality of bolts 58 have threaded engagement with the side walls of the housing 21 and partition elements 23, 24, and hold the cover element 57 and partition elements 23, 24 securely in place. Cover element 57 has an opening 59 formed therein which corresponds generally to the shape of the upper portion of the track portion 30 and allows the upper portion thereof to move from the full line position of FIG. 4 to an elevated operative position for switching a vehicle. In order that the internal working parts of housing 21 are maintained in a generally rust free condition, the housing 21 is filled with a liquid lubricant 60. As shown in FIG. 4, when the track portion 30 is in its lowered inoperative position, the liquid lubricant 60 substantially fills the interior of the housing 21. As such, the liquid lubricant 60 not only lubricates the internal parts of the housing 21, thus assuring ease of operation thereof without binding, but in cooperation with cover 57, tends to discourage the entrance of foreign material, such as water and/or granular particles, into the housing 21 which may subsequently cause malfunction of the switching mechanism 20.

It will be noted by reference to FIG. 3 that the terminal end of sidetrack 13 is formed to overlie and rest upon an angularly relieved portion 61 formed on an adjacent end of housing 21. Also, track 11 is formed to overlie and rest on an angularly relieved portion 61*a* formed on opposite ends of the housing 22. Thus, adequate support is provided for the tracks 13, 11 in the vicinity of the housings 21, 22 of switching mechanism 20.

Means for simultaneously moving a track portion 30, 30*a* associated with one of the housings 21, 22 to a vertically elevated operative position and a track portion 30, 30*a* associated with the other of the housings 21, 22 to a vertically lowered inoperative position includes differential gear means, indicated generally by the numeral 64, and control means positioned laterally of the pair of main tracks, indicated generally by the numeral 65. As seen particularly in FIGS. 1 and 4, differential gear means 64 includes a housing 66 mounted on the tie elements 12 which support the housings 21, 22. The housing 66 has a pair of shafts 67, 68 journaled for rotation therein on coaxial axes. A pair of bevel gears 69, 70 are fixedly carried by adjacent ends of the shafts 67, 68, respectively, within housing 66, for common rotation with their respective shafts 67, 68. An intermediate bevel gear 71 is rotatably mounted on the housing 66 and has meshing engagement with each of the bevel gears 69, 70. The outer end of each of the shafts 67, 68 are respectively coupled to the shafts 49, 49*a* associated with housings 21, 22 and drive gears 47, 47*a* respectively mounted therein.

It will be noted that the switching mechanism associated with housing 22 differs from the switching mechanism associated with housing 21 in that the upper portion of track portion 30*a* is generally rectangular in horizontal cross section and that cam surface 31*a* thereof extends in a line generally parallel to the longitudinal direction of track 11. It will be also noted that track 11 at the juncture thereof with track 14 is relieved transversely thereof in an amount equal to the transverse dimension of the upper portion of track portion 30*a* for a reason which will become apparent hereinafter during a description of the operation of the switching mechanism 20.

Mounted for rotation in the housing 66 of differential gear means 64 and extending laterally therefrom along an axis parallel to the shafts 67 and 49 is a rotary shaft 75. Fixedly carried by the shaft 75, within the housing 66, is a bevel gear 76. Bevel gear 76 has meshing engagement with the bevel gear 79 and upon rotation of the gear 76 rotation is imparted to the gears 69, 70 and 71. Shaft 75 extends laterally outwardly from the housing 66 in underlying relationship to the housing 21 and track 10 and has its outer free end journaled for rotation in a housing or standard 77 of switch control means 65. Housing or standard 77 is fixedly mounted on adjacent ones of the tie elements 12 which underlie the housings 21, 22 and mount the differential gear means 64. A bevel gear 78 is fixedly carried by the extended end of the rotary shaft 75 and has meshing engagement with a bevel gear 79 carried by one end of a generally vertically extended rotary shaft 80 which is mounted for rotation in the standard 77. An electrically operated rever-

sible gear head motor **81**, connected to a source of power not shown, is mounted in the housing or standard **77** and includes a power output shaft having a beveled gear **82** fixedly mounted thereon. Bevel gear **82** has meshing engagement with a bevel gear **83** fixedly carried by the vertical shaft **80**, and upon energization of the gear head motor **81**, rotation of the gear **82** imparts rotation to the gear **83** and shaft **80**.

Means for manually rotating the shaft **80** includes a vertical extension **84** of shaft **80** which is releasably coupled to shaft **80** as at **85**. A handle **86** extends laterally from the shaft **84** through a slot **87** formed in the side wall of the housing or standard **77** and terminates exteriorally of the housing **77**. Generally vertically and laterally extended notches **88, 89** are formed at opposite ends of the slot **87** and movement of the handle **86** upwardly and laterally into one of the notches **88, 89** disengages the shaft **84** from the shaft **80**.

DESCRIPTION OF THE OPERATION

As shown particularly in FIGS. **1—4**, the track portions **30, 30*a*** are positioned to maintain the travel of the wheels of a vehicle along the main line tracks **10, 11**. That is, track portion **30*a*** is shown in an elevated operative position and track portion **30** is shown in a lowered inoperative position. In this position the flange of the wheel supported on track **11** is prevented from entering a groove **90** formed at the juncture of the tracks **11** and **14** by cam surface **31*a***. At the same time, a wheel supported on the track **10** is allowed to pass over the upper portion of the track portion **30** out of engagement with cam surface **31** thereof and enter a groove **91** formed between the tracks **10, 13** at the juncture thereof, thus allowing the wheels of the vehicle to travel along the main tracks **10, 11**.

When it is desired to switch the wheels of the vehicle from travel along the main tracks **10, 11** onto the side tracks **13, 14**, the handle **86** is operated to move same from left to right with respect to FIG. **7** or alternatively the motor **81** is energized to rotate the shaft **80** in a counterclockwise direction. This causes movement of the shaft **75** in a counterclockwise direction, shafts **67, 49** in a clockwise direction, and shafts **68, 49***a*in a counterclockwise direction. Movement of the shaft **49** in a clockwise direction imparts the correct rotation to the gear trains **45, 46** to simultaneously raise the track portion **30** and move the inclined ramps **35, 36**, longitudinally of the housing **21**, toward each other until the uppermost surface of the track portion **30** is coplanar with the uppermost surface of the track **10**. At the same time, movement of the shaft **49*a*** in a counterclockwise direction imparts the correct rotation to the gear trains **45*a*, 46*a***to cause movement of the track portion **30*a*** toward a vertically lowered inoperative position and inclined ramps **35*a*, 36*a***, longitudinally of the housing **22**, away from one another to a position such as that illustrated in FIG. **2** relative to inclined ramps **35, 36**.

When the track portions **30, 30*a*** have assumed their respective vertically elevated operative position and lowered inoperative position above described, the flange of the wheel supported on track **10** engages the cam surface **31** to guide such wheel onto track **13**. At the same time the wheel supported by track **11** moves into overlying relationship to the track portion **30*a***and onto track **14**. Since the track portion **30*a*** has been moved to a lower inoperative position, the flange of the wheel moving onto the track **14** is allowed to pass thereover and into the groove **90** between the tracks **11, 14**.

Due to the construction of supporting structure for wheels normally associated with track guided vehicles, wherein the wheels are maintained in a substantially fixed distance transversely of the tracks, the camming action of the surface **31**, associated with track portion **30**, imparts a like camming action to the wheel supported on track **11**. Thus, the wheel on track **11** is caused to enter the slot **90** and move onto track **14**, while the wheel supported by track **10** moves onto track **13**. Reversing of the above-outlined procedure obviously returns the track portions **30, 30*a*** to their full line position shown in FIG. **4** and subsequent vehicles traveling along the tracks **10, 11** are allowed to bypass the side tracks **13, 14** due to camming action of surface **31*a*** on the wheel supported on track **11**.

It can be seen from the above description that the moving parts of the switch mechanism **20** are mounted within their respective housings **21, 22** in a manner to permit free vertical movements between vertically elevated operative positions and vertically lowered inoperative positions without binding of the moving parts and with a minimum of friction. Also, by substantially enclosing the moving parts within the housings **21, 22** and within a liquid lubricant, there is less likelihood that foreign particles, such as sand, snow, and ice, or water, which may turn to ice during the colder winter months, may enter the housings **21, 22** causing malfunction of the switch mechanism **20**. Thus, a switching mechanism for tracks has been provided which results in safe, dependable and maintenance-free operation over prolonged periods of time.

I claim:

1. Switch mechanism for use with a pair of vehicle supporting main tracks and a pair of side tracks extending from said main tracks and comprising:

a. elongated housing means adapted to be mounted adjacent the point of juncture of the pair of main and side tracks in juxtaposition to one of the tracks between the pair of main tracks and below the uppermost surface of the tracks, said housing means including a pair of housings one each of which is mounted on one of and between the pair of main tracks at the juncture thereof with the pair of side tracks;

b. a track portion formed of a portion of one of the main and side tracks mounted in each of said housings for vertical movements between an operative position and an inoperative position and including longitudinally spaced vertically extended rack gear portions;

c. cam means mounted in each of said housings for movements longitudinally of said track portion and engageable with opposite ends thereof whereby to support said track portion in a horizontally disposed position when said track portion is in an operative position; and

d. means mounted within each of said housings for imparting simultaneous movements to said cam means in directions longitudinally of said track portion and to said track portion in said vertical direction whereby to move said track portion in a horizontally disposed vertical direction to a position to switch a vehicle from the pair of main tracks to the pair of side tracks, said means for imparting simultaneous movements to each of said cam means and their respective track portions comprising gear means including first and second gear trains mounted in each of said housings in meshing engagement with each other and one of said rack portions of a respective track portion to move said track portions vertically to said operative and inoperative positions and said cam means longitudinally of said track portions.

2. The structure of claim **1** in which end of said cam means comprises:

a. first and second inclined ramps mounted in each of said housings in underlying relationship to opposite ends of respective track portions;

b. an arm extending laterally from each of said inclined ramps and longitudinally of respective ones of said track portions;

c. a rack gear formed on the extended end of each of said arms; and

d. one each of said rack gears having meshing engagement with one of said gear trains whereby rotation of said gear trains to move said respective track portions in vertical directions causes respective inclined ramps to move in a direction longitudinally of said respective track portions to maintain same in a generally horizontal condition.

3. The structure of claim **2** in which each of said gear trains includes:

a. a driving gear mounted in meshing engagement with each other and one of said rack gears associated with one of said inclined ramps;

b. a driven gear mounted in meshing engagement with one of said rack gears of said track portions; and

c. an intermediate gear mounted to have meshing engagement with its respective driving and driven gear.

4. The structure of claim 1 in which each of said housings is filled with a liquid lubricant.

5. The structure of claim 3 in further combination with means operatively connected to one of the pair of driving gears associated with one of the housings and one of the driving gears associated with the other of said housings for simultaneously moving a track portion associated with said one housing to a vertically elevated operative position and a track portion associated with said other of said housings to a vertically lowered inoperative position.

6. The structure of claim 5 in which said means includes:

a. a drive shaft extending from a given one of said drive gears of each of said housings;

b. differential gear means connected to the free end of each of said drive shafts and adapted to simultaneously drive same in opposite directions of rotation; and

c. control means positioned laterally of the pair of main tracks and operatively connected to said differential gear means to impart rotation thereto.

7. The structure of claim 6 in which said last mentioned means includes:

a. a rotary shaft operatively connected to said differential gear means;

b. an electrically operated reversible gear head motor;

c. means including a standard operatively connecting said motor to said rotary shaft to drive same in a selected direction of rotation; and

d. means releasably coupled to said rotary shaft for manually rotating same.

8. The structure of claim 2 in which said rack gear associated with one of said inclined ramps in each housing is laterally offset with respect to said rack gear associated with the other of said inclined ramps in each housing and in which said one of said rack gears in each of said housings is vertically offset with respect to the other of said rack gears in each of said housings.